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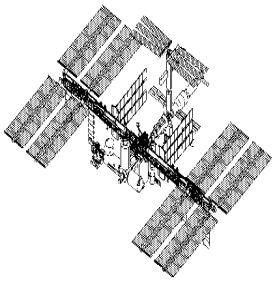
International Space Station Program
Science and Utilization

S683-35458
Critical Item Development Specification for the Suitcase Test Environment for Payloads (STEP)

REV A



INTERNATIONAL SPACE STATION

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Critical Item Development Specification for the Suitcase Test Environment for Payloads

Type B2

prepared for
National Aeronautics and Space Administration (NASA)
Huntsville, Alabama

by

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Authenticated by _____ **Approved by** _____

Dated _____ **Dated** _____

INTERNATIONAL SPACE STATION PROGRAM

CRITICAL ITEM DEVELOPMENT SPECIFICATION FOR THE SUITCASE TEST ENVIRONMENT for PAYLOADS (STEP)

05 SEPTEMBER 1996

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FORWARD

This specification defines the Suitcase Test Environment for Payloads (STEP). The STEP is a portable test environment intended to be used by a space station payload developer or an International Standard Payload Rack (ISPR) integrator to verify the ISPR data interfaces to the space station.

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SPECIFICATION CHANGE HISTORY

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FIGURES

APPENDICES

1. SCOPE

1.1 Identification. This document is identified as the Critical Item Development Specification for the Suitcase Test Environment for Payloads (STEP). This specification establishes the performance, design, development, test, and acceptance requirements for the STEP critical item.

1.2 STEP overview. This specification defines the Suitcase Test Environment for Payloads (STEP). The STEP is a portable test set intended to be used by a Space Station payload developer or an ISPR integrator to verify the ISPR data interfaces to the Space Station.

1.3 Document overview. This document uses the format specified by MIL-STD-490A, Appendix III, B2 Critical Item Development Specification.

Section 1, Scope, specifies the scope of this document and provides an overview of the STEP and its purpose.

Section 2, Applicable Documents, identifies applicable documents which are referenced in this document. The applicable documents serve as requirements upon this document to the extent specified in the requirements of sections 3, 4, and 5.

Section 3, STEP Requirements, specifies the performance and design requirements for the STEP.

Section 4, Quality Assurance Provisions, specifies the methods and responsibilities for formal tests and verifications of STEP performance.

Section 5, Preparation for Delivery, provides guidance for the preparation and delivery of the STEP.

Section 6, Notes, provides a glossary of terms and an acronym list.

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2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the document referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

SPECIFICATIONS

Federal

Military

National Aeronautics and Space Administration (NASA)

SSP 42139	Space Station Program High Rate Frame Multiplexer (HRFM) to U.S. Laboratory Interface Control Document (ICD)
SSP 41002 Revision D	International Standard Payload Rack to NASA/ESA/ NASDA Modules ICD
SP-M-502B	Configuration Item Specification Payload Ethernet Hub/Gateway (PEHG)
NHB 2410.9	NASA Automated Information Security System Handbook
NHB-5300.4(1B)	Quality Program Provisions for Aeronautical and Space System Contractors
SSP 41175	Station Management and Control to International Space Station Alpha Prime Contractor Software Interface Control Document

STANDARDS

Federal

Military

MIL-STD-130F	Identification Marking of U.S. Military Property
MIL-STD-1553B	Digital Time Division Command/Response Multiplex Data Base
MIL-STD-1472D	Human Engineering Design Criteria for Military Systems, Equipment, and Facilities

NASA

DRAWINGS

Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting officer.

OTHER PUBLICATIONS

2.2 Non-government documents.

SPECIFICATIONS

STANDARDS

ANSI/IEEE 802.3	CSMA/CD Local Area Network Specification, Type 10BASE-T
ANSI X3.131	Small Computer System Interface Communication Standard, Revision 17b

DRAWINGS

OTHER PUBLICATIONS

EIA-232	Interface Between Data Terminal Equipment and Data Circuit Terminating Equipment Employing Serial Binary Data Interchange

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.

2.3 Reference documents. The following documents were used for information in deriving, or supporting, system requirements.

MIL-STD-490A	Specification Practices
NHB 6000.1D	Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components
MIL-STD-810D	Environmental Test Methods and Engineering Guidelines
D683-41212-1	PSIV/F Development Plan
D683-35455-1	STEP User's Guide
D683-35456-1	STEP Acceptance Test Procedures
D683-21415-1	PSIV to Payload Data Library (PDL) Interface Control Document (ICD)

2.4 Parent documents. The requirements in the following document served as parents for the derived requirements that appear in this specification.

S683-35451	Prime Item Development Specification for the Payload Software Integration and Verification Capability

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3. STEP REQUIREMENTS

3.1 STEP definition. The STEP is a portable computing system designed to simulate the command and data interfaces to a U.S. controlled ISPR location. The space station command and data interfaces simulated include the Payload Multiplexer/Demultiplexer (MDM), the Automated Payload Switch (APS), and the Payload Ethernet Hub/Gateway (PEHG). The STEP will also model indirect interfaces to the ground (uplink and downlink), the station provided Portable Computer System (PCS), and the High Rate Frame Multiplexer (HRFM). The ISPR Internal Audio/Video (IAV) interface test capability will be accomplished by using the Common Video Interface Unit (CVIU). The CVIU connects to the user's ISPR and the user's Video Ground Support Equipment (GSE). The CVIU will be provided to the user on an as needed basis and is not an integral part of the STEP.

The STEP can be used at the user's site during development and will have both local mode and remote mode testing capabilities. The STEP local test mode refers to independent interface testing conducted by the user at his development site. The equipment involved includes the STEP, the user's payload, and any user provided GSE necessary to support the payload. The remote test mode refers to interface testing that includes the user's payload and the Payload Software Integration and Verification Facility (PSIV/F). The equipment involved includes the STEP, the PSIV Test Environment (PTE) with its flight payload avionics Functional Equivalent Units (FEUs), the user's payload, and any user provided GSE necessary to support the payload. The STEP is available for off-line payload checkout, by the user, at the Payload Integration and Checkout Facility (PICF) during the Final Interface Verification Test (FIVT) timeframe.

3.1.1 STEP system diagram. Figure 1 illustrates the STEP system diagram.

3.1.2 STEP interface definition. The STEP provides an interface to: the user for control and monitoring of the STEP, the user provided Portable Computer System (PCS) or Ethernet Laptop for external payload control and monitoring, the ISPR for payload commanding and data gathering, the user provided video source or monitor for video interface testing, the PSIV/F for remote testing of the ISPR and data file transfer, and the facility for input power. Figure 2 illustrates the STEP external interfaces.

3.1.2.1 STEP ISPR interfaces.

3.1.2.1.1 Low Rate Data Link (LRDL) interface.

a. The STEP shall provide a MIL-STD-1553B interface to test payload to Payload MDM data interfaces consistent with performance requirements in section 3.2.

b. The STEP MIL-STD-1553B interface shall be transformer coupled.

c. The LRDL interface shall provide flight compatible connectors to interface with the payload LRDL interface.

d. The LRDL interface shall provide commercial connectors to interface with the user provided PCS FEU and test equipment.

e. The LRDL interface shall include a single redundant MIL-STD-1553B bus (i.e., channel A and B).

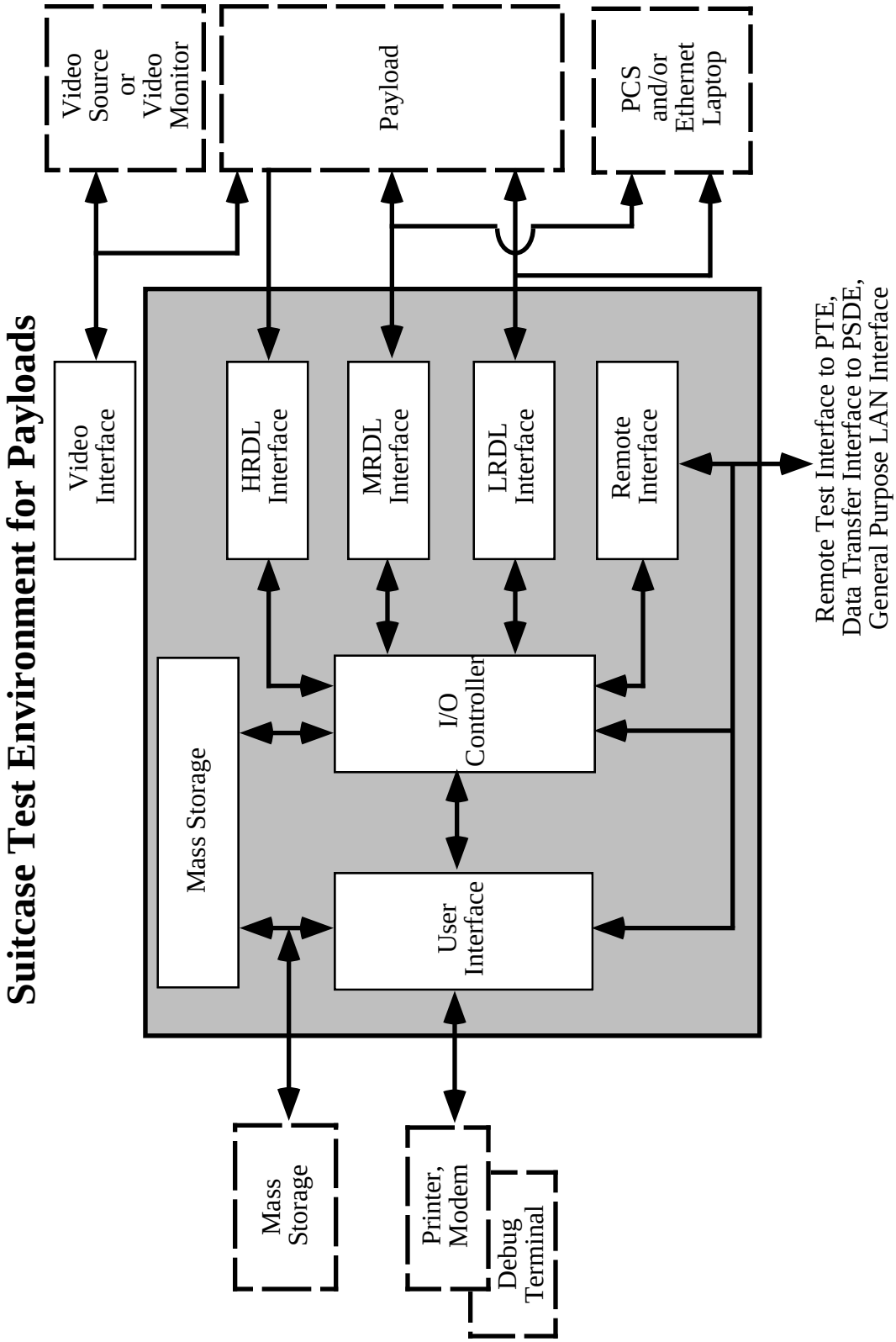

FIGURE 1 STEP System Diagram

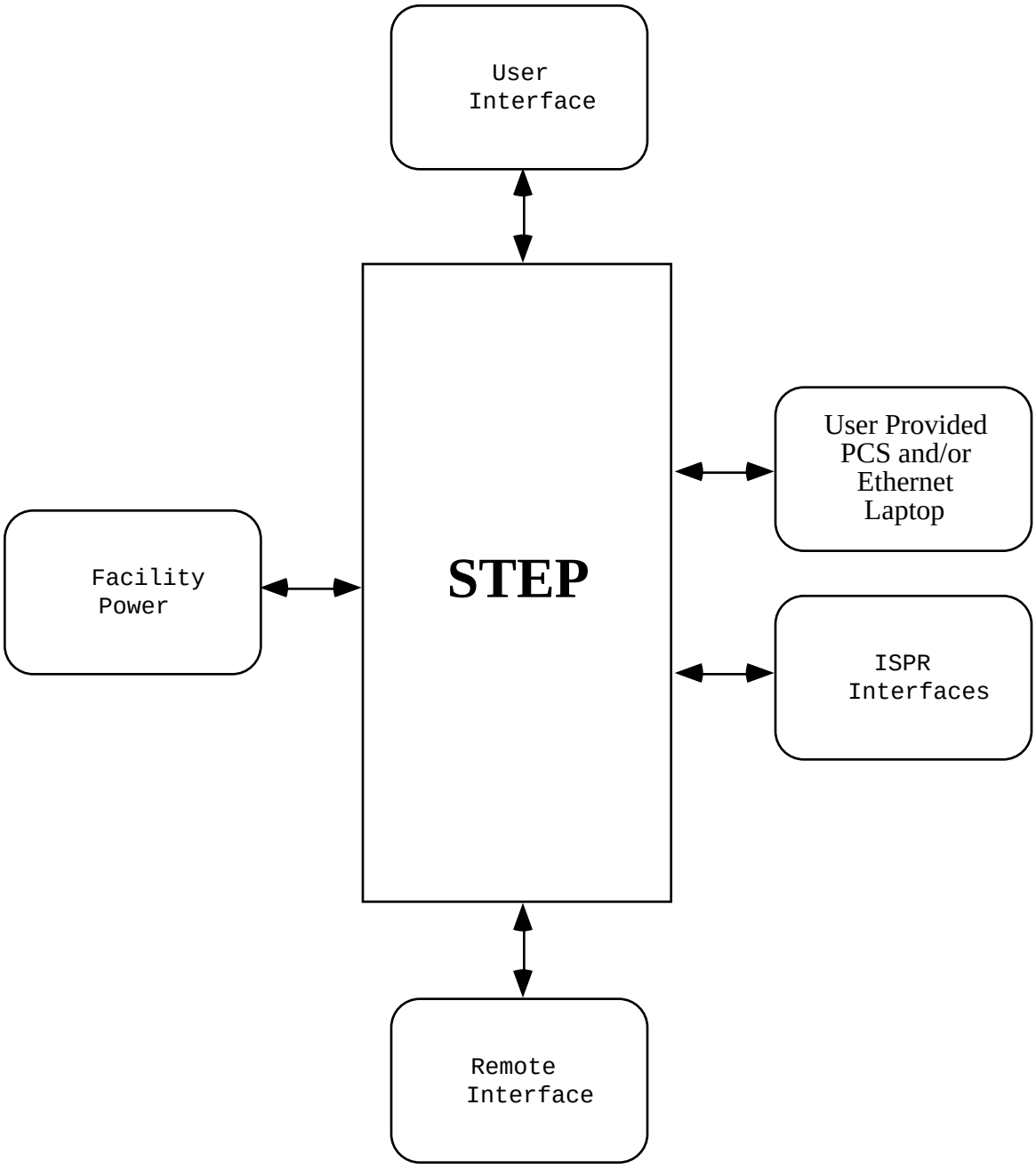

FIGURE 2 STEP External Interfaces

f. The LRDL interface shall provide one redundant (i.e. channel A & B) connection for the attachment of user provided test equipment.

g. The LRDL interface shall provide one redundant (i.e. channel A & B) connection for the attachment of a user provided PCS FEU.

3.1.2.1.2 Medium Rate Data Link (MRDL) interface.

a. The STEP shall provide a CSMA/CD ANSI/IEEE 802.3 signal regeneration interface to test payload to Payload Ethernet Hub Gateway (PEHG) data interfaces consistent with the performance requirements in section 3.2.

b. The STEP shall provide at least three MRDL interfaces.

c. The STEP MRDL interface shall provide flight compatible connectors to interface with the payload MRDL interfaces.

d. The STEP MRDL interface shall accommodate twisted shielded pair cabling with characteristics per SP-M-502, section 3.2.2.1.1.

3.1.2.1.3 High Rate Data Link (HRDL) interface.

a. The STEP shall provide a fiber optic interface to test the payload to HRFM data interface per the characteristics defined in SSP 41002, ISPR to NASA/ESA/NASDA Modules ICD, Section 3.3.5.4.

b. The STEP HRDL interface shall provide flight compatible connectors to interface with the payload HRDL interfaces.

c. The STEP HRDL interface shall be capable of receiving a fiber optic signal in accordance with the characteristics and pulse shape defined in SSP 42139, section 3.2.3.3.

d. The STEP HRDL interface shall be capable of receiving payload generated packet and bitstream data in the transmission protocol defined in SSP 42139, section 3.2.3.2.

e. The STEP HRDL interface shall provide a single optical receiver connection for receipt of payload generated HRDL packet and bitstream data.

3.1.2.2 STEP user interface.

a. The STEP user interface shall provide a color visual display for presentation of text and graphics.

b. The STEP user interface shall provide a keyboard for user text input.

c. The STEP user interface shall provide a cursor control/pointing device.

d. The STEP user interface shall provide removable media mass storage capabilities.

e. The STEP user interface shall provide one RS232 data interface and one parallel data interface for the attachment of a user provided printer/modem.

f. The STEP user interface shall provide at least one RS232 data interface for the attachment of a user provided diagnostic terminal to aid in STEP trouble shooting and STEP software/hardware upgrades.

g. The STEP user interface shall provide a SCSI interface for the attachment of a user provided mass storage device (per ANSI X3.131) to increase the STEP data logging capacity.

h. The STEP user interface shall provide a CSMA/CD ANSI/IEEE 802.3 interface with TCP/IP functionality for attachment of the STEP to a user provided Local Area Network (LAN).

3.1.2.3 STEP remote interface.

a. The STEP shall provide a remote test connection to the PTE to support interface verification testing consistent with performance requirements in section 3.2.

b. The STEP shall provide a remote file transfer connection to the PSIV Software Development Environment (PSDE).

c. The STEP remote interface shall provide a CSMA/CD ANSI/IEEE 802.3 interface for attachment to the Internet for remote test and file transfer.

d. The STEP shall be capable of interfacing with the Payload Data Library (PDL) per the PSIV to PDL ICD (D683-21415) (i.e. payload unique commands, ancillary data)

3.1.2.4 STEP facility power interface.

a. The STEP shall operate on grounded single phase, 120 Volts Alternating Current (VAC), 60 Hertz (Hz) power.

b. The STEP shall utilize a NEMA 5-15P connector(s) for attachment to facility power.

3.1.3 STEP component list. A STEP production unit contains the following components: transport/storage containers, a main system unit, user interface components, software media, documentation, and appropriate cabling.

3.2 Characteristics.

3.2.1 Performance. The STEP can operate in three states: the pre-session state, the session execution state, and the post-session state. The following sections define the performance of the STEP in each of these states.

3.2.1.1 Pre-session state. The pre-session state is defined as the state that the STEP is in prior to the execution of a test session. The pre-session state provides extensive user capabilities to run diagnostics tests, develop payload unique displays, enter session preparation data, and manage user developed files.

3.2.1.1.1 Diagnostics mode.

a. The STEP shall be capable of executing board level diagnostics tests on STEP hardware.

b. The STEP shall be capable of logging the results of board level diagnostic tests.

3.2.1.1.2 User display development mode.

a. The STEP shall provide a tool to allow the user to create payload unique graphical displays.

b. The STEP shall provide a tool to allow the user to integrate payload unique graphical displays with the STEP provided Graphical User Interface (GUI).

3.2.1.1.3 Session preparation mode.

a. The STEP shall allow the user to define payload unique commands for use in the session execution state.

b. The STEP shall allow the user to define payload unique health and status display data definitions.

c. The STEP shall allow the user to define payload unique low rate telemetry display data definitions.

d. The STEP shall allow the user to define payload unique ancillary data.

e. The STEP shall allow the user to define payload unique ancillary data sets.

f. The STEP shall allow the user to define payload unique MRDL data definitions.

g. The STEP shall allow the user to define payload unique HRDL packet data definitions.

h. The STEP shall allow the user to create STEP command scripts, which may include payload and STEP commands.

i. The STEP shall allow the user to define Payload MDM interface simulation initialization data.

j. The STEP shall be capable of incorporating flight Payload Executive Software (PES) tables into the Payload MDM interface simulation initialization data.

k. The STEP shall allow the user to define PEHG interface simulation initialization data.

l. The STEP shall allow the user to define multiple session configurations.

m. The STEP shall allow software configuration changes to accommodate user provided peripherals described in section 3.1.2.2.

3.2.1.1.4 User file management mode.

a. The STEP shall provide the capability to backup user files created during the Session Preparation mode.

b. The STEP shall provide the capability to restore user files created during the Session Preparation mode.

c. The STEP shall provide the capability to delete user files created during the Session Preparation mode.

3.2.1.2 Session execution state. The session execution state is defined as the state that the STEP operates in during a test session.

a. The STEP shall be capable of executing a test session.

b. The STEP shall allow the user to select either the local test mode or the remote test mode.

3.2.1.2.1 Local test mode. The STEP local test mode allows the user to independently test their payload to station interfaces from their development facility. The equipment involved includes the STEP, the user's payload, and any user provided GSE necessary to support their payload. The following paragraphs define the STEP functions available in the local test mode.

3.2.1.2.1.1 Commanding. The STEP will be capable of processing STEP commands and user defined payload commands.

3.2.1.2.1.1.1 STEP commanding.

a. The STEP commanding function shall be capable of executing logging commands.

b. The STEP commanding function shall be capable of executing data display commands.

c. The STEP commanding function shall be capable of executing simulation control commands.

d. The STEP commanding function shall be capable of executing user defined command scripts that may contain any combination of user defined payload commands and predefined STEP commands.

3.2.1.2.1.1.2 Payload commanding.

a. The STEP payload commanding function shall be capable of processing and transmitting user defined payload commands via the LRDL interface.

3.2.1.2.1.2 Data displays.

3.2.1.2.1.2.1 STEP provided data display services.

a. The STEP shall be capable of displaying every LRDL message type (i.e. health & status data, low rate telemetry, ancillary data, and 1553B data monitor messages).

b. The STEP shall be capable of displaying LRDL data in raw and converted format (the converted format is uniquely tailored by the user for their specific payload in the Session Preparation mode).

c. The STEP shall be capable of displaying every MRDL message type (i.e. telemetry and payload to payload messages).

d. The STEP shall be capable of displaying MRDL data in raw and converted format (the converted format is uniquely tailored by the user for their specific payload in the Session Preparation mode).

e. The STEP shall be capable of displaying every HRDL message type (i.e. packet or bitstream).

f. The STEP shall be capable of displaying a limited pre-selected range of HRDL data in raw and converted format (the limited range is uniquely tailored by the user for their specific payload in the Session Preparation mode).

g. The STEP shall be capable of displaying STEP command feedback.

h. The STEP shall be capable of displaying STEP status.

3.2.1.2.1.2.2 User provided payload data display services.

a. The STEP shall be capable of executing payload unique graphical displays created by the user in the User Display Development mode.

3.2.1.2.1.3 Data logging.

a. The STEP data logging function shall be capable of logging up to ten hours of LRDL data at a maximum sustained input data rate of 500 Kilobits per second (Kb/s) when only logging LRDL data.

b. The STEP data logging function shall be capable of logging up to one hour of MRDL data at a maximum sustained input data rate of 5 Megabits per second (Mb/s) when only logging MRDL data.

c. The STEP data logging function shall be capable of logging up to thirty minutes of HRDL data at a maximum sustained input data rate of 10 Mb/s when only logging properly formatted and transmitted HRDL data.

d. The STEP data logging function shall be capable of logging LRDL, MRDL, and HRDL data simultaneously, up to the capacity of the STEP mass storage logging partition, when the total aggregate sustained data input rate is 10 Mb/s or less.

e. The STEP shall be capable of logging the commands specified in section 3.2.1.2.1.1.

f. The STEP will, as a design goal, be capable of logging properly formatted and transmitted HRDL data consistent with the performance requirements of the aggregate and peak data rates for all HRFM inputs as specified in SSP 42139, section 3.2.3.2.

3.2.1.2.1.4 Payload MDM interface simulation.

a. The STEP Payload MDM interface simulation shall simulate the Payload MDM low rate telemetry service interface per SSP 41002.

b. The STEP Payload MDM interface simulation shall simulate the Payload MDM ancillary data service interface per SSP 41002.

c. The STEP Payload MDM interface simulation shall simulate the Payload MDM health and status service interface per SSP 41002.

d. The STEP Payload MDM interface simulation shall simulate the Payload MDM payload commanding service interface per SSP 41002.

e. The STEP Payload MDM interface simulation shall simulate the Payload MDM procedure execution service interface per SSP 41002.

f. The STEP Payload MDM interface simulation shall simulate the Payload MDM payload limit exception service interface per SSP 41002.

g. The STEP Payload MDM interface simulation shall simulate the Payload MDM file transfer service interface per SSP 41002.

h. The STEP Payload MDM interface simulation shall be capable of acting as the MIL-STD- 1553B bus controller to simultaneously service a single payload Remote Terminal (RT) and a single user provided Station PCS RT.

i. The STEP Payload MDM interface simulation shall simulate the Payload MDM PCS command poll and data display capabilities per SSP 41175.

j. The STEP Payload MDM interface simulation shall simulate the Payload MDM broadcast time and sync capabilities per SSP 41175.

3.2.1.2.1.5 PEHG interface simulation.

a. The STEP PEHG interface simulation shall support a user provided crew laptop, a user provided station PCS, and the transfer of payload command/telemetry data.

b. The STEP PEHG interface simulation shall operate at the data rate of consistent with the implementation of a 10BASE-T network.

c. The STEP PEHG interface simulation shall provide performance functionality per the requirements of SP-M-502, section 3.2.1.1, except as follows:

(1) the simulation will use the number of ports specified in section 3.1.2.1.2 b of this specification,

(2) an Attachment User Interface (AUI) port is not required,

(3) the functions utilizing the MIL-STD-1553B interface will be accomplished via the STEP command capability,

(4) the requirements pertaining to a single extended network do not apply,

(5) the packet statistics requirements are provided in requirement 3.2.1.2.1.5 i of this specification.

d. The STEP PEHG interface simulation shall be capable of capturing 10BASE-T packets including packets normally routed for downlink via the PEHG gateway function.

e. The STEP PEHG interface simulation shall simulate the gateway buffering capabilities consistent with the requirements of SP-M-502, section 3.2.1.2.1, except as follows:

(1) the gateway functions IEEE 802.3 address is not required to be programmable,

(2) the removal of the IEEE 802.3 packet overhead, the capability of latching into the TAXI encoding chip, and the gateway's output data rate are not applicable.

f. The STEP PEHG interface simulation shall simulate gateway buffer full conditions consistent with SP-M-502, section 3.2.1.2.1, except as follows:

(1) all packets will be logged,

(2) functions utilizing the MIL-STD-1553B interface will be accomplished via the STEP command capability.

g. The STEP PEHG interface simulation shall simulate flow control capabilities consistent with SP-M-502, section 3.2.1.2.1, except as follows:

(1) the functions utilizing the MIL-STD-1553B interface will be accomplished via the STEP command capability.

h. The STEP PEHG interface simulation shall be controlled via a simulation control functions consistent with the requirements in SP-M-502, section 3.2.1.3.2.2, except as follows:

(1) command functions utilizing the MIL-STD-1553B interface will be accomplished via the STEP command capabilities,

(2) the response time from receipt of a command is not applicable,

(3) loading of the gateway IEEE 802.3 address and output data rate are not applicable.

i. The STEP PEHG interface simulation shall provide reporting functions consistent with the requirements of SP-M-502, section 3.2.1.3.2.3, except as follows:

(1) command functions utilizing the MIL-STD-1553B interface will be accomplished via the STEP command capabilities,

(2) the response time from receipt of a command is not applicable.

3.2.1.2.1.6 HRDL processing.

a. The STEP HRDL processing function shall be capable of determining and reporting the data rate of the payload generated HRDL packet or HRDL bitstream.

b. The STEP HRDL processing function shall be capable of determining and reporting the packet gap between payload generated HRDL packets.

c. The STEP HRDL processing function shall be capable of capturing all payload generated HRDL packet data up to a sustained data rate of 10 Mb/s.

d. The STEP HRDL processing function shall be capable of capturing all payload generated HRDL bitstream data up to a sustained data rate of 10 Mb/s.

e. The STEP HRDL processing function shall be capable of determining and reporting payload generated HRDL packet delimiter values.

f. The STEP HRDL processing function shall be capable of determining and reporting data transmission errors on the HRDL interface.

g. The STEP HRDL processing function shall be capable of determining and reporting HRDL packet and byte count statistics.

h. The STEP HRDL processing function shall allow STEP commands to start and stop the capture of payload generated HRDL data.

i. The STEP HRDL processing function shall allow STEP commands to initialize the HRDL interface.

j. The STEP HRDL processing function shall allow STEP commands to reset the HRDL interface.

k. The STEP HRDL processing function shall allow STEP command to control the transfer of captured HRDL data from the HRDL interface for logging.

l. The STEP HRDL processing function shall allow STEP commands to control the transfer of HRDL interface status data for display.

m. The STEP HRDL processing function shall group captured HRDL data and related statistics for logging.

n. The STEP HRDL processing function shall transfer the grouped data (captured data and statistics data) to the STEP logging function for logging.

3.2.1.2.1.7 Low level protocol testing.

a. The STEP low level protocol testing function shall have the capability to verify that the payload interface has properly implemented all the MIL-STD-1553B required (non-optional) parameters.

b. The STEP low level protocol testing function shall have the capability to verify that the payload interface responds properly to a series of off-nominal/error conditions for: parity, bit count, Manchester encoding, sync character, data continuity, word count, and intermessage gap in the MIL-STD-1553B interface.

c. The STEP low level protocol testing function shall have the capability to report all anomolies generated during the test including: remote terminal error, status response, and bus activity statistics and time correlation of activities.

3.2.1.2.2 Remote test mode. The remote test mode of the STEP brings the PTE into the test session loop. This has a twofold purpose. First, for the payload developer, the remote test mode allows testing of payload interfaces using real Payload MDM software executing in equipment in the PTE. Secondly, as an option, the remote test mode allows the PTE to conduct a payload complement interface integration and verification test session with the addition of a real "remote" payload. The use of a remote payload during a complement test is not required. A STEP operating in the remote test mode involves a test session with the following equipment configuration: the STEP, the PTE with its flight payload avionics FEUs, the user's payload, any necessary user provided GSE and the communication link between the STEP and the PTE.

In the remote test mode, payload commands can be issued by the user from his development facility. The remote interface link sends the payload commands to the PTE. The PTE accepts the payload commands, wraps ancillary data with the commands and sends them back to the STEP for transmittal to the user's payload. The payload returns health and status data and low rate telemetry data to the PTE and the STEP for analysis. The user has the ability to monitor both the payload commands and ancillary data coming from the PTE and the Health and Status data and Low Rate Telemetry data from the payload. The payload developer has the option of using the local PEHG interface simulation or communicating remotely with a PEHG FEU in the PTE. Figure 3 illustrates the command and data path in the remote test mode.

a. The STEP remote test mode shall be selectable via the control and monitoring portion of the STEP user interface.

b. The STEP remote test mode shall be activated and terminated via the STEP user interface.

3.2.1.2.2.1 Commanding.

a. The STEP remote test mode shall be capable of executing the STEP and payload commands defined in section 3.2.1.2.1.1.

3.2.1.2.2.2 Data displays.

a. The STEP remote test mode shall provide the data display services defined in section 3.2.1.2.1.2.

b. The STEP remote test mode shall identify whether the connection with the PTE is active via the STEP user interface.

3.2.1.2.2.3 Data logging.

a. The STEP remote test mode shall provide the local data logging capabilities defined in section 3.2.1.2.1.3.

3.2.1.2.2.4 Payload MDM remote interface simulation. In the remote test mode the user can send payload commands, via the STEP remote capability, to the payload MDM FEU located in the PTE. The Payload MDM accepts the payload commands, encapsulates them with the appropriate ancillary data and Medium Rate Data (MRD) and sends this information out to the Payload, via the STEP remote capability.

a. The STEP Payload MDM remote interface shall allow the user to send payload commands to the PTE during a remote test session.

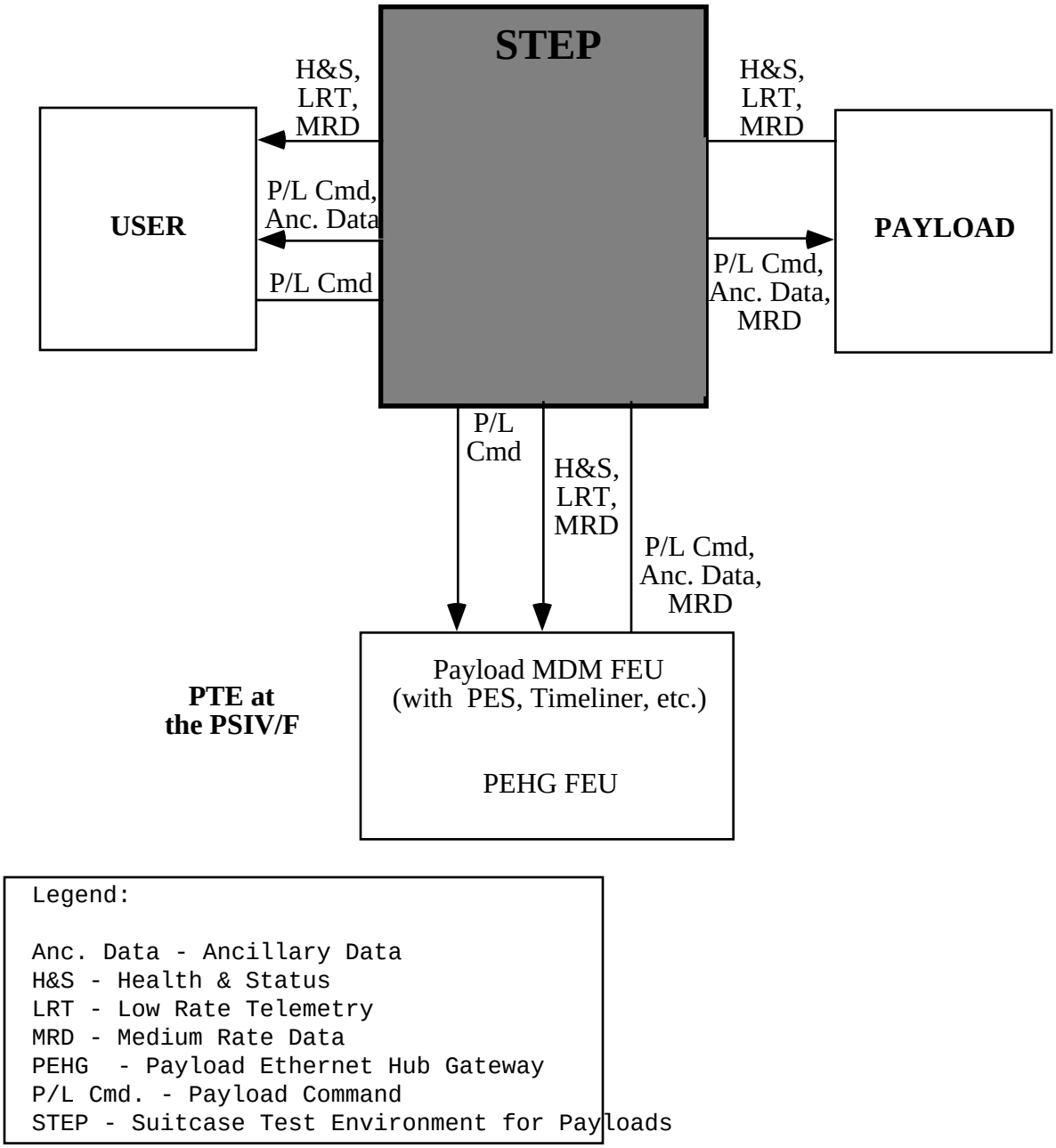

FIGURE 3 Payload Command & Data Routing In the Remote Test Mode

b. The STEP Payload MDM remote interface shall accept payload commands and ancillary data from the PTE for transmittal to the payload during a remote test session.

c. The STEP Payload MDM remote interface shall transfer payload health and status data and low rate telemetry data to the PTE during a remote test session.

3.2.1.2.2.5 PEHG interface simulation. The PEHG interface simulation provided in the STEP may be used in lieu of remote testing with the PEHG Functional Equivalent Unit (FEU) in the PTE. If a remote test with the PTE PEHG FEU is required, then the STEP will forward all incoming MRDL traffic to the PTE and forward all MRDL data from the PTE to the payload.

3.2.1.2.2.5.1 Local interface simulation.

a. The STEP shall provide the local PEHG interface simulation as defined in section 3.2.1.2.1.5.

3.2.1.2.2.5.2 Remote interface simulation.

a. The STEP remote interface link shall transmit and receive MRDL data in near real time during a remote test session.

3.2.1.2.2.6 HRDL processing.

a. The STEP remote test mode shall support the local HRDL processing defined in section 3.2.1.2.1.6.

3.2.1.3 Post-session state. The post-session state is the state that the STEP is in after a test session has been concluded.

3.2.1.3.1 Commanding.

3.2.1.3.1.1 STEP commanding.

a. The STEP shall be capable of executing data retrieval commands.

b. The STEP shall be capable of executing data display commands.

c. The STEP shall be capable of executing log file control commands.

3.2.1.3.2 Data displays.

a. The STEP shall provide the data display services defined in section 3.2.1.2.1.2.

3.2.1.3.3 Data retrieval.

a. The STEP shall be capable of retrieving LRDL related data logged during session execution.

b. The STEP shall be capable of retrieving MRDL related data logged during session execution.

c. The STEP shall be capable of retrieving HRDL related data logged during session execution.

3.2.2 Physical characteristics.

3.2.2.1 Weight.

a. Prior to being packaged for shipment, each individual STEP transportable item shall not exceed the lift requirements for two people (male only population) carrying an object 10 meters or less per Table XXIII of MIL-STD- 1472D.

b. As a design goal, each individual STEP transportable item will weigh less than 100 pounds.

3.2.2.2 Dimensions.

a. The STEP shall have a physical footprint no greater than 8 feet by 4 feet excluding cabling to the payload under test.

3.2.2.3 Transport and storage.

a. The STEP shall be designed to operate as required by this specification after exposure to the normal storage and transportation conditions using the criteria in MIL-STD-810D as a guide.

3.2.2.4 Durability.

a. The STEP shall be durable to the extent required to withstand normal intended use during operation, maintenance, handling, assembly, and disassembly.

3.2.3 Reliability. Not applicable

3.2.4 Maintainability.

3.2.4.1 Accessibility.

a. STEP design shall permit ready access to interior parts for easy removal and replacement of major component parts.

3.2.4.2 Component installation, removal, and repair.

a. STEP components subject to normal replacement or servicing shall not be secured by rivets, welding, or other means that would prohibit easy removal.

b. Provisions shall be made for the removal and replacement of all parts that are subject to wear, deterioration, or change.

3.2.4.2.1 Fasteners.

a. The STEP shall include captive fasteners on those components which normally require removal for maintenance and troubleshooting.

3.2.4.2.2 Tools and test equipment.

a. The STEP shall be designed to permit maintenance with general purpose tools and equipment available commercially.

3.2.4.4 Failure detection and diagnostics.

a. To aid in failure detection and diagnostics, the STEP shall permit rapid visual inspection of components or component status indicators for items most likely to fail.

b. The STEP shall support board level diagnostic tests as discussed in section 3.2.1.1.1.

c. The STEP shall provide loop back capabilities to aid in the detection of failures in the simulated data interfaces to the payload under test.

3.2.5 Environmental conditions.

a. STEP equipment shall operate over a temperature range of 60 degrees Fahrenheit (F) to 80 degrees F.

b. STEP equipment shall operate over a relative humidity range of 10% to 90%, non-condensing.

3.2.6 Transportability.

a. STEP hardware and accessories shall be packaged in transportation/storage containers capable of accommodating normal commercial modes of transportation.

b. The STEP transportation/storage container design shall use NHB 6000.1D as a guide.

c. The STEP transportation/storage containers shall provide environmental protection of the STEP equipment.

d. The STEP transportation/storage containers shall be reusable.

e. The STEP transportation/storage containers shall accommodate marking/labeling to indicate container content.

3.2.7 Portability.

a. The STEP shall be designed to be a portable system allowing partial disassembly for transportation.

3.3 Design and construction.

The STEP will be developed in accordance with the procedures documented in D683-41212, PSIV/F Development Plan and the following requirements.

3.3.1 Materials, processes, and parts.

a. STEP hardware shall be composed of COTS items to the maximum extent possible.

b. All STEP surfaces shall be finished for considerations of appearance, personnel safety, and protection against corrosion or other deterioration.

c. The use of protective coatings on STEP components that will crack, peel, chip, or scale shall be avoided.

d. Commercial parts incorporated into the STEP shall be used in a manner consistent with their documented design intent.

e. STEP brackets, clamps, inserts, and other mounting arrangements shall securely retain components and parts especially during transportation.

f. STEP parts shall be secured in such a manner that failure of a single fastener will not free the part.

g. Circuit protection devices shall be incorporated to protect STEP components from damage.

h. Routing of STEP wiring and cabling shall not allow bending or placement around any sharp corner or edge which could damage the conductor insulation.

i. Wiring shall be clearly identified per the associated engineering drawing.

j. STEP connectors and connections shall have durable strips, arrows, or other indications to show the positions of alignment pins or equivalent devices for proper insertion.

3.3.2 Electromagnetic radiation.

a. The STEP shall be designed to be electromagnetically compatible with itself.

3.3.3 Nameplates and product marking.

a. STEP components shall be marked for identification per MIL-STD-130F.

b. STEP markings shall be designed and applied to remain functional for the service life of the components to which they are affixed.

c. Precautionary markings shall be provided as necessary to warn personnel of hazardous conditions per the intent of MIL-STD-1472D to ensure the safety of personnel and prevent equipment damage.

3.3.4 Workmanship.

a. Workmanship inspections shall be performed in accordance with NHB-5300.4(1B) requirements.

3.3.5 Interchangeability.

a. The design of the STEP shall maximize the use of interchangeable items with the EXPRESS suitcase simulators.

3.3.6 Safety.

a. The STEP shall not degrade or contaminate any attached flight payload system/hardware at any time.
b. Electrical design shall comply with applicable industry standards.

3.3.7 Human performance/human engineering.

a. Standardized terminology, acronyms, and abbreviations shall be used throughout STEP documentation and code.

b. STEP displays shall be standardized so that similar applications employ similar operator procedures.

c. STEP design shall incorporate the intent of MIL-STD-1472D.

3.3.8 Security.

a. The STEP shall be in compliance with the rules set forth by NASA Automated Information Security (AIS) System level 2 security excluding encryption defined in NHB 2410.9, NASA Automated Information Security System Handbook.

3.3.9 Computer resource reserve capability.

a. The STEP shall be delivered to the user with at least 75% reserve capacity in mass storage utilization.

3.4 Documentation.

3.4.1 Drawing requirements.

a. Drawing requirements will be described in the PSIV/F Development Plan, D683-41212-1.

3.4.2 Technical manuals.

a. STEP documentation will include all hardware, software, (including COTS items and any associated modifications) and processes necessary to install, maintain, operate, and repair STEP equipment.

b. The STEP User's Guide, D683-35455 and other related STEP documentation discussed in the PSIV/F Development Plan, D683-41212-1 will be developed.

3.4.3 Test plans & procedures.

a. The STEP Acceptance Test Procedures (ATP) will be developed and documented in the STEP ATP, D683-35456-1.

3.5 Logistics.

3.5.1 Maintenance.

a. The STEP will be supported by PSIV/F technical resources to assist ISPR payload developers with problems encountered during STEP operation.

b. The STEP will be supported by the PSIV/F to fix STEP units returned for repair.

c. The STEP will be user serviceable to the maximum extent possible.

3.5.2 Supply.

a. The STEP will be designed to use common hardware and standard parts to reduce the number of types of spares and repair parts required for support.

3.5.3 Facilities.

a. User facilities will be required to provide the physical space, the environmental controls, and the electrical power required to operate the STEP.

3.6 Precedence. In the event of conflict of requirements between this specification and other related program documents, the following order of precedence will apply:

a. Prime Item Development Specification (PIDS) for the PSIV Capability (S683-35451).

b. This specification

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4. QUALITY ASSURANCE PROVISIONS

4.1 General.

a. The STEP will be developed using the Configuration Control procedures defined in the PSIV/F Development Plan (D683-41212-1).

b. STEP testing will be performed at MSFC.

c. STEP test methods which will be used for verification are inspection, analysis, demonstration and test. These methods are defined in the glossary and may be applied singly or in combination to verify compliance.

d. Test conditions will be recorded at the beginning and end of each test.

e. Unless otherwise specified herein, or in attendant approved test procedure, the tests and demonstrations defined herein will be conducted at the following ambient conditions:

Ambient temperature: 70 F +/- 10 F
Relative Humidity: 10 percent to 90 percent, non-condensing.

4.1.1 Responsibility for tests. The STEP developer will be responsible for performing STEP testing for acceptance by the customer.

4.1.2 Special tests and examinations. The STEP developer may conduct development type tests to develop design approaches, select materials or select processes. The STEP developer is responsible for planning, conducting, and provisioning the development tests. Other special tests and examinations will be performed to determine cause when failures of the following type occur:

Repeated failures occur
Corrective actions are ineffective.
Death or injury occur with no clear cut cause.

4.2 Quality conformance inspection. Appendix A of this specification provides a requirements traceability and verification matrix. This matrix traces STEP capability requirements to parent requirements in the PIDS for the PSIV Capability (S683-35451). This matrix also defines how each STEP requirement will be verified: inspection, demonstration, analysis, or test.

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5. PREPARATION FOR DELIVERY

5.1 General.

a. The methods of preservation, packaging, and packing used for shipment, together with necessary special control during transportation, will adequately protect the STEP from damage or degradation in reliability or performance as a result of the natural and induced environments encountered during transportation and subsequent indoor storage.

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6. NOTES

6.1 Definitions.

ANALYSIS

A verification method utilizing techniques and tools such as math models, compilation, similarity assessments, validation of records, etc., to confirm that verification requirements have been satisfied.

ANCILLARY DATA SERVICE

A capability of the Payload MDM simulation that provides ancillary data to an active payload.

DEMONSTRATION

A method of verification denoting the qualitative determination of properties of an end item or component by observation. Demonstration is used with or without special test equipment or instrumentation to verify performance, human engineering features, transportability, and displayed data.

FILE TRANSFER SERVICE

A capability of the payload MDM simulation that supports Mass Storage Unit (MSU) access for file reads/writes.

FLIGHT COMPATIBLE CONNECTOR

A non-flight connector that has the same form and fit as its corresponding flight qualified component. Cleanliness and material quality will not be maintained.

FUNCTIONAL EQUIVALENT UNIT (FEU)

A non-flight component that performs the same functions in exactly the same way as the corresponding flight component but which differs in design and construction

HEALTH AND STATUS SERVICE

A capability of the Payload MDM simulation that supports the collection and downlink of payload health and status data.

INSPECTION

A method of verification of physical characteristics that determines compliance with requirements without the use of special laboratory equipment, procedures, test support items, or services. Inspection uses standard methods such as visual, gauges, etc., to verify compliance with requirements of construction features, document and drawing compliance, workmanship, physical condition, and service code.

LOW RATE TELEMETRY (LRT) SERVICE

A capability of the Payload MDM simulation that supports the low rate downlink of payload data.

MISSION INCREMENT DATA

Data that is specific to a specific increment such as mission sequences, procedures, Ephemeris data, and orbital mechanics data.

PAYLOAD COMMANDING SERVICE

A capability of the Payload MDM simulation that routes commands to a specific payload.

PAYLOAD DEVELOPER SOFTWARE

Software developed by the payload experiment developer to execute in the user's processor(s).

PAYLOAD EXECUTIVE SOFTWARE (PES)

Payload management/support software developed by Product Group 3 (PG-3) (Boeing-Huntsville). It executes in the Payload MDM. It is designed as payload system software independent of increment payload configurations that utilize payload specific data definitions, data files, procedures, and displays. Similar to SPACELAB Experiment Computer Operating System (ECOS).

PAYLOAD LIMIT EXCEPTION SERVICE

A capability of the Payload MDM simulation that monitors payload and payload system data to detect out-of-limit conditions.

PROCEDURE EXECUTION SERVICE

A capability of the Payload MDM simulation that services requests from payloads, laptops, and the Payload Operations and Integration Center (POIC) that control the execution of automated sequences.

SIMULATION CONTROL COMMANDS

A set of predefined STEP commands which allow the user to control the simulations contained in the STEP. For example, typical simulation control commands for the Payload MDM interface simulation will include: payload startup/shutdown notification commands, start/stop ancillary data service commands, start/stop low rate telemetry data service commands, start/stop health & status display data commands.

REMOTE TESTING

A STEP mode of operation which allows the payload developer to test his payload's interfaces with the Payload MDM FEU and PEHG FEU in the PSIV/F's PTE. The remote testing capability also allows the option for the payload developer to participate in a payload complement interface integration and verification test session conducted in the PTE.

TEST

A method of verification wherein performance requirements are verified by measurement during or after the controlled application of functional and environmental stimuli. These measurements may require the use of laboratory equipment, recorded data, procedures, test support items, or services.

6.2 Abbreviations & acronyms. The following abbreviations and acronyms are used in this document.

Anc.	Ancillary
ANSI	American National Standards Institute
APS	Automated Payload Switch
ATP	Acceptance Test Procedures
AUI	Asynchronous User Interface
Cmd	Command
COTS	Commercial Off The Shelf
CSMA/CD	Carrier Sense, Multiple Access with Collision Detection
CVIU	Common Video Interface Unit
EIA	Engineering Integration Agreement
ESA	European Space Agency
EXPRESS	EXpedite the PRocessing of Experiments to Space Station.
F	Fahrenheit
FEU	Functional Equivalent Unit
GSE	Ground Support Equipment
GUI	Graphical User Interface
H&S	Health & Status
HRDL	High Rate Data Link
HRFM	High Rate Frame Multiplexer
Hz	Hertz
IAV	Internal Audio Video
ICD	Interface Control Document
IEEE	Institute of Electrical & Electronics Engineers
I/O	Input/Output
ISPR	International Standard Payload Rack
ISS	International Space Station
Kb/s	Kilobits per second
LAN	Local Area Network
LRDL	Low Rate Data Link
LRT	Low Rate Telemetry
Mb/s	Megabits per second
MDM	Multiplexer/Demultiplexer
MRD	Medium Rate Date
MRDL	Medium Rate Data Link
MSFC	Marshall Space Flight Center

NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency
NEMA	National Electrical Manufacturer Association
PCS	Portable Computer System
PDL	Payload Data Library
PEHG	Payload Ethernet Hub Gateway
PES	Payload Executive Software
PG	Product Group
PICF	Payload Integration & Checkout Facility
PIDS	Prime Item Development Specification
POIC	Payload Operations Integration Center
PSDE	Payload Software Integration and Verification Software Development Environment
PSIV/F	Payload Software Integration and Verification/Facility
PTE	Payload Software Integration and Verification Test Environment
RIC	Rack Interface Controller
RT	Remote Terminal
SCSI	Small Computer Systems Interface
SLOC	Software Lines Of Code
STEP	Suitcase Test Environment for Payloads
TBD	To Be Determined
TCP/IP	Transmission Control Protocol/Internet Protocol
U.S.	United States
VAC	Volts Alternating Current

APPENDIX A - REQUIREMENTS TRACEABIILTY/VERIFICATION MATRIX

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APPENDIX A Requirements Traceability/Verification Matrix

B2 Requirement Paragraph Number	Paragraph Title	Verification Method	Parent Paragraph Number
3.1.2.1.1-a	Low Rate Data Link Interface	A, D	PSIV B1 3.1.2.1.1-e, 3.7.3.1-a,
3.1.2.1.1-b	Low Rate Data Link Interface	A, I	PSIV B1 3.1.2.1.1-e, 3.7.3.1-a,
3.1.2.1.1-c	Low Rate Data Link Interface	I	PSIV B1 3.1.2.1.1-e, 3.7.3.1-a,
3.1.2.1.1-d	Low Rate Data Link Interface	I	PSIV B1 3.1.2.1.1-e, 3.7.3-k, 3.7.3.1-a, 3.7.3.4-a
3.1.2.1.1-e	Low Rate Data Link Interface	I	PSIV B1 3.7.3.1-a
3.1.2.1.1-f	Low Rate Data Link Interface	I	PSIV B1 3.1.2.1.1-e
3.1.2.1.1-g	Low Rate Data Link Interface	I	PSIV B1 3.1.2.1.1-e
3.1.2.1.2-a	Medium Rate Data Link Interface	A, D	PSIV B1 3.7.3.2-a
3.1.2.1.2-b	Medium Rate Data Link Interface	I	PSIV B1 3.7.3-k, 3.7.3.2-a, 3.7.3.4-a
3.1.2.1.2-c	Medium Rate Data Link Interface	I	PSIV B1 3.7.3.2-a
3.1.2.1.2-d	Medium Rate Data Link Interface	A	PSIV B1 3.7.3.2-a
3.1.2.1.3-a	High Rate Data Link Interface	A	PSIV B1 3.7.3.3-a
3.1.2.1.3-b	High Rate Data Link Interface	I	PSIV B1 3.7.3.3-a
3.1.2.1.3-c	High Rate Data Link Interface	A	PSIV B1 3.7.3.3-a
3.1.2.1.3-d	High Rate Data Link Interface	T	PSIV B1 3.7.3.3-a
3.1.2.1.3-e	High Rate Data Link Interface	I	PSIV B1 3.7.3.3-a
3.1.2.2-a	STEP User Interface	D	PSIV B1 3.7.3-c
3.1.2.2-b	STEP User Interface	I	PSIV B1 3.7.3-c
3.1.2.2-c	STEP User Interface	I	PSIV B1 3.7.3-c
3.1.2.2-d	STEP User Interface	D	PSIV B1 3.7.3-c, f, j
3.1.2.2-e	STEP User Interface	D, I	PSIV B1 3.7.3-c
3.1.2.2-f	STEP User Interface	D, I	PSIV B1 3.7.3-c
3.1.2.2-g	STEP User Interface	D, I	PSIV B1 3.7.3-c

3.1.2.2-h	STEP User Interface	D, I	PSIV B1 3.7.3-c
3.1.2.3-a	STEP Remote Interface	A, D	PSIV B1 3.2.1.6-b, 3.7.3-g
3.1.2.3-b	STEP Remote Interface	A, D	PSIV B1 3.7.3-g, h
3.1.2.3-c	STEP Remote Interface	A, D	PSIV B1 3.7.3-g
3.1.2.4-a	STEP Facility Power Interface	D	PSIV B1 3.7.3-a
3.1.2.4-b	STEP Facility Power Interface	I	PSIV B1 3.7.3-a
3.2.1.1.1-a	Diagnostics Mode	D	PSIV B1 3.7.3-a
3.2.1.1.1-b	Diagnostics Mode	D	PSIV B1 3.7.3-a
3.2.1.1.2-a	User Display Development Mode	D	PSIV B1 3.7.3-c
3.2.1.1.2-b	User Display Development Mode	D	PSIV B1 3.7.3-c
3.2.1.1.3-a	Session Preparation Mode	D	PSIV B1 3.7.3-c, d
3.2.1.1.3-b	Session Preparation Mode	D	PSIV B1 3.7.3-c, d
3.2.1.1.3-c	Session Preparation Mode	D	PSIV B1 3.7.3-c, d
3.2.1.1.3-d	Session Preparation Mode	D	PSIV B1 3.7.3-c, d
3.2.1.1.3-e	Session Preparation Mode	D	PSIV B1 3.7.3-c, d
3.2.1.1.3-f	Session Preparation Mode	D	PSIV B1 3.7.3-c, d
3.2.1.1.3-g	Session Preparation Mode	D	PSIV B1 3.7.3-c, d
3.2.1.1.3-h	Session Preparation Mode	D	PSIV B1 3.7.3-l, 3.7.3.1-h
3.2.1.1.3-i	Session Preparation Mode	D	PSIV B1 3.7.3-d, 3.7.3.1-a
3.2.1.1.3-j	Session Preparation Mode	D	PSIV B1 3.7.3-h
3.2.1.1.3-k	Session Preparation Mode	D	PSIV B1 3.7.3-d, 3.7.3.1-a
3.2.1.1.3-l	Session Preparation Mode	D	PSIV B1 3.7.3-d
3.2.1.1.3-m	Session Preparation Mode	D	PSIV B1 3.7.3-c
3.2.1.1.3-n	Session Preparation Mode	D	PSIV B1 3.7.3-c
3.2.1.1.4-a	User File Management Mode	D	PSIV B1 3.7.3-f
3.2.1.1.4-b	User File Management Mode	D	PSIV B1 3.7.3-e

3.2.1.1.4-c	User File Management Mode	D	PSIV B1 3.7.3-d
3.2.1.2-a	Session Execution State	D	PSIV B1 3.7.3-a, c
3.2.1.2-b	Session Execution State	D	PSIV B1 3.7.3-c, 3.7.3.5-e
3.2.1.2.1.1.1-a	STEP Commanding	D	PSIV B1 3.7.3-e
3.2.1.2.1.1.1-b	STEP Commanding	D	PSIV B1 3.7.3-e
3.2.1.2.1.1.1-c	STEP Commanding	D	PSIV B1 3.7.3-d, e
3.2.1.2.1.1.1-d	STEP Commanding	D	PSIV B1 3.7.3-l, 3.7.3.1-h
3.2.1.2.1.1.2-a	Payload Commanding	T	PSIV B1 3.7.3-c, 3.7.3.1-a
3.2.1.2.1.1.2-b	Payload Commanding	T	PSIV B1 3.7.3-c, 3.7.3.1-a
3.2.1.2.1.2.1-a	STEP Provided Data Display Services	D	PSIV B1 3.7.3.1-i
3.2.1.2.1.1.2.1-b	STEP Provided Data Display Services	D	PSIV B1 3.7.3.1-i
3.2.1.2.1.1.2.1-c	STEP Provided Data Display Services	D	PSIV B1 3.7.3.1-i
3.2.1.2.1.1.2.1-d	STEP Provided Data Display Services	D	PSIV B1 3.7.3.1-i
3.2.1.2.1.1.2.1-e	STEP Provided Data Display Services	D	PSIV B1 3.7.3.1-i
3.2.1.2.1.1.2.1-f	STEP Provided Data Display Services	D	PSIV B1 3.7.3.1-i
3.2.1.2.1.1.2.1-g	STEP Provided Data Display Services	D	PSIV B1 3.7.3-c
3.2.1.2.1.1.2.1-h	STEP Provided Data Display Services	D	PSIV B1 3.7.3-c
3.2.1.2.1.2.2-a	User Provided Payload Data Display Services	D	PSIV B1 3.7.3-c, e
3.2.1.2.1.3-a	Data Logging	D	PSIV B1 3.7.3-e, i
3.2.1.2.1.3-b	Data Logging	D	PSIV B1 3.7.3-e, i
3.2.1.2.1.3-c	Data Logging	D	PSIV B1 3.7.3-e, i
3.2.1.2.1.3-d	Data Logging	D	PSIV B1 3.7.3-e, i
3.2.1.2.1.3-e	Data Logging	D	PSIV B1 3.7.3-e, i
3.2.1.2.1.4-a	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1-b
3.2.1.2.1.4-b	Payload MDM interface simulation	A, T	PSIV B1 3.7.3-m, 3.7.3.1-g
3.2.1.2.1.4-c	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1-e, f
3.2.1.2.1.4-d	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1-c, d
3.2.1.2.1.4-e	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1-c, d

3.2.1.2.1.4-f	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1-c, d
3.2.1.2.1.4-g	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1-j, k
3.2.1.2.1.4-h	Payload MDM interface simulation	A, T	PSIV B1 3.7.3-d, k, 3.7.3.4-a
3.2.1.2.1.4-i	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1- c
3.2.1.2.1.4-j	Payload MDM interface simulation	A, T	PSIV B1 3.7.3.1- c
3.2.1.2.1.5-a	PEHG interface simulation	D	PSIV B1 3.7.3.2-a
3.2.1.2.1.5-b	PEHG interface simulation	A, D	PSIV B1 3.7.3.2-a
3.2.1.2.1.5-c	PEHG interface simulation	A, T	PSIV B1 3.7.3.2-a
3.2.1.2.1.5-d	PEHG interface simulation	T	PSIV B1 3.7.3.2-a
3.2.1.2.1.5-e	PEHG interface simulation	T	PSIV B1 3.7.3.2-a
3.2.1.2.1.5-f	PEHG interface simulation	T	PSIV B1 3.7.3.2-a
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